Dental SaaS Platform for Clinic and Laboratory Management

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Abstract — In today's time, digital solutions are becoming common in many different fields, especially in healthcare where handling information properly and maintaining clear communication is very important. Even then, many dental clinics still rely on older ways to communicate with laboratories, such as phone calls, messaging apps, and written records. These methods are not very dependable and often lead to issues like missing information, delays in communication, incorrect order details, and no reliable way to track work progress. Because of this, the overall performance of dental services is affected. To address these problems, we developed DentLink, a web-based Dental Lab Management Platform. It provides a single system where dentists and laboratories can work together in a more organized way. Dentists can store patient data, create lab orders with proper details like tooth selection and materials, and check the progress of their orders. At the same time, laboratories can receive orders, update their work status, manage pricing, generate invoices, and handle delivery updates in a structured manner. This application is created with tools like React.js for the user interface, Node.js with Express for backend processing, and PostgreSQL for storing data securely. User access is controlled based on their role, so each user can only use the features allowed to them. The system follows a client–server model, which helps in smooth data flow and allows multiple users to work on the system at the same time without affecting performance. After testing the system in different practical situations, it was found that the platform improves overall system performance, reduces chances of manual mistakes, and makes communication between dentists and laboratories clearer. It also keeps data secure and allows users to access it whenever needed, saving both time and effort. Overall, DentLink is a reliable and scalable solution for managing dental clinic and laboratory activities. It helps move from manual work to a digital system, making operations faster and better organized. In the future, the system can be improved further by adding features like AI-based analysis, automatic report generation, and support through a mobile-based app to enhance usability.

Keywords: Dental Lab Management; Web-Based Application; React.js; Node.js; PostgreSQL; Order Tracking; Role-Based Access Control; Healthcare System; Workflow Automation; SaaS Platform

I. INTRODUCTION

In recent times, digital solutions have grown rapidly and have improved many sectors, especially healthcare. Managing information properly and maintaining clear communication between departments are important for providing quality services. In dental clinics, coordination between dentists and laboratories plays a key role because it directly affects treatment accuracy and delivery time.

However, this coordination is still handled using older methods such as phone calls, messaging apps, and manual record-keeping. These approaches are not very reliable and can cause problems like communication gaps, delays in processing orders, incorrect details, and even loss of important data. In addition, there is no proper system to manage orders, patient records, and billing, which makes the workflow unorganized and difficult to manage. As the number of patients and procedures increases, handling everything manually becomes more complex and error-prone.

To overcome these issues, a single well-organized system is required that can manage all activities in one place. A web-based platform can connect dentists and laboratories, allowing smooth communication, secure data storage, and tracking of orders as they progress. This reduces manual work and helps improve overall productivity.

In this project, we introduce DentLink, a web-based Dental Lab Management System designed to simplify the interaction between dentists and laboratories. The platform allows dentists to store patient records, create detailed lab orders, and check their progress, while laboratories can receive orders, update their status, manage pricing, and handle billing tasks. The system is built using technologies such as React.js, Node.js, and PostgreSQL to ensure good performance, security, and scalability.

The main purpose of this system is to improve communication, reduce human errors, and provide a more organized and transparent workflow for dental practices. It helps simplify dental operations by replacing traditional methods with an efficient digital system.

II. RELATED WORK

Various systems have been developed in the healthcare field to improve the way data is handled and shared between users. Most of these systems focus on storing patient information in digital form, scheduling appointments, and managing routine administrative tasks. While these solutions reduce paperwork and make data storage easier, they still do not fully satisfy the needs of dental clinics, especially when it comes to coordination between dentists and laboratories.

Some web-based healthcare platforms allow patient information to be stored and accessed across different departments, which improves data availability. However, these systems often do not include features like tracking order progress or properly connecting with dental laboratories. Because of this limitation, dentists still rely on external communication methods that are not structured and can result in errors. There are also hospital management systems that automate processes such as billing, report creation, and record maintenance. Although these systems help in managing hospital operations efficiently, they are not specifically designed for dental workflows. They lack features like creating lab orders, selecting materials, and monitoring the progress of dental procedures.

In many cases, dentists and laboratories exchange order details through messaging applications or email. Even though these methods are simple and easy to use, they are not

suitable for organized professional workflows. Important information can be missed, and there is no proper way to track or manage orders effectively.

Some advanced systems try to provide complete solutions using web technologies, but they are often complex and not easy to use. In addition, they may not include proper control over user access, which is necessary to maintain data security.

To overcome these issues, the DentLink system is proposed. It provides a simple and easy-to-use platform that connects dentists and laboratories in one place. The system focuses on tracking order progress, improving communication, storing data securely, and managing workflow in an organized way, making it suitable for dental clinic and laboratory operations.

III. Proposed System

The DentLink system is designed as a web-based SaaS application to simplify and streamline the workflow between dental clinics and laboratories. The core concept of this platform is to move away from conventional communication practices and introduce a centralized digital solution. It includes secure authentication for login, and access to system features is managed through role-based permissions for users such as dentists and laboratory staff.

All essential information, including patient data, lab orders, and billing details, is stored in a PostgreSQL database. This ensures that the data remains secure, properly structured, and easily retrievable when needed. The platform also provides live updates, allowing users to stay informed about the progress of their orders. It is built to support multiple users simultaneously without performance issues. Overall, the system aims to enhance data reliability, communication, and workflow efficiency.

A. Description of the Proposed System:

The primary goal of this system is to minimize manual effort, improve coordination between dentists and laboratories, and make the entire process more efficient and transparent. The working of the system can be described as follows:

1) Step 1: User Authentication:

Users, including dentists and laboratory staff, log into the system using secure credentials. After successful login, the system identifies the user type and grants access only to the permitted features, ensuring proper security and control.

2) Step 2: Patient and Order Management:

Dentists can enter and maintain patient information within the system. They can also create lab orders by providing necessary details such as tooth selection, materials, and specific instructions. Each order is assigned a unique identifier for easy tracking.

3) Step 3: Laboratory Processing:

Once an order is submitted, it is forwarded to the laboratory through the system. The laboratory team can review the order, begin processing, and update its status as work progresses. They can also handle pricing based on selected materials and services.

4) Step 4: Order Tracking:

Dentists can monitor the progress of their orders at any time. This live tracking feature reduces confusion and enhances transparency between dentists and laboratories.

5) Step 5: Billing and Record Management:

The system includes billing features that allow invoice generation and storage of payment details. All records are maintained systematically for future reference.

6) Step 6: Data Storage and Workflow Optimization:

All system-related information is stored in an organized manner within the PostgreSQL database. The platform reduces manual work by automating key processes and ensures a smooth and efficient workflow between users.

IV. System Architecture

The DentLink system is based on a client–server architecture in which the frontend communicates with the backend through APIs, while all data is maintained in a centralized database. The overall workflow of the system can be described step by step as follows:

1) Step 1: User Login

Users such as dentists and laboratory staff sign in using their credentials. The login process ensures that only valid users are allowed to access the system.

2) Step 2: Role-Based Access

After logging in, the system detects the user's role and grants access to relevant modules. Dentists and laboratory staff are limited to the features assigned to them, which helps maintain security.

3) Step 3: Patient Registration

Dentists can add new patient information and manage existing records. All patient data is securely stored for future use.

4) Step 4: Order Creation

Dentists generate lab orders by entering required details such as tooth selection, material type, and specific instructions. Each order is recorded with a unique ID for identification.

5) Step 5: Order Transmission

After creation, the order is forwarded to the laboratory through backend APIs, enabling quick and reliable communication between dentists and laboratories.

6) Step 6: Lab Processing

The laboratory receives the order and begins processing it. Staff members can update the order status at different stages of completion.

7) Step 7: Order Tracking

Dentists can check the current status of their orders at any time. This helps improve transparency and reduces unnecessary communication.

8) Step 8: Billing Management

Once the order is completed, the laboratory generates an invoice and records the payment details within the system.

9) Step 9: Data Storage

All relevant information, including patient records, order details, and billing data, is securely maintained in the PostgreSQL database.

10) Step 10: End

The cycle continues for new orders, ensuring a consistent and efficient workflow between dentists and laboratories.

V. RESULTS AND DISCUSSION

The DentLink system was tested in different practical situations involving dentists and dental laboratories to check how well it works and how easy it is to use. The application was developed using React.js for the frontend, Node.js with Express for backend processing, and PostgreSQL for storing data. All major features, such as patient registration, lab order creation, order tracking, and billing, were tested and worked correctly without any problems.

The system was evaluated based on aspects like accuracy, speed of communication, data handling, and overall performance. When compared with traditional methods such as phone calls, messaging apps, and paper records, the system showed clear improvements. It helped reduce delays, avoid confusion in order details, and keep records properly organized.

Dentists were able to manage patient data and create lab orders easily, while laboratories could receive orders, update their progress, and handle billing tasks smoothly. The order tracking feature allowed dentists to check the status of their work whenever needed, which made the process more transparent and reduced unnecessary communication.

The results indicate that the system helps reduce manual mistakes, saves time, and improves the overall workflow. The database stores all information securely and allows users to access it easily whenever required. The system also allows multiple users to use it at the same time without affecting performance, making it suitable for real-world use.

Based on these observations, DentLink can be considered a dependable and practical solution for managing dental clinic and laboratory activities. It provides a more organized and efficient way of handling daily operations compared to traditional methods.

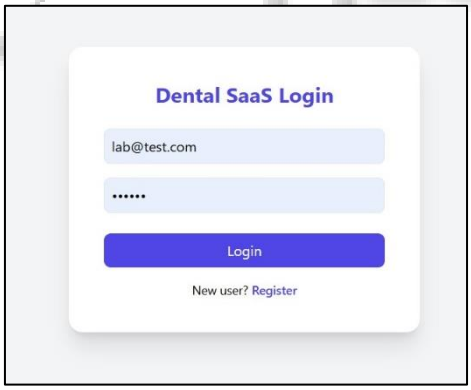

Fig. 1: User Login Interface of DentlLink System Selection

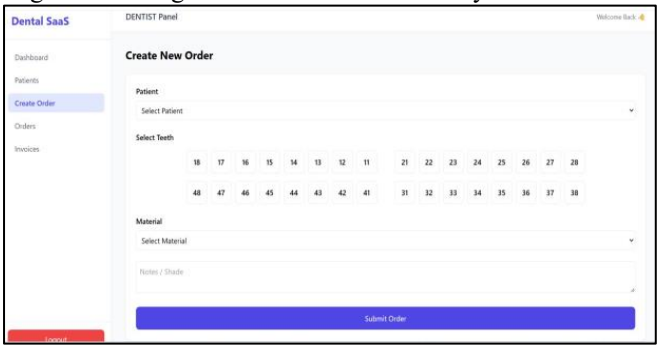

Fig. 2: Order Creation Module with Tooth and Material

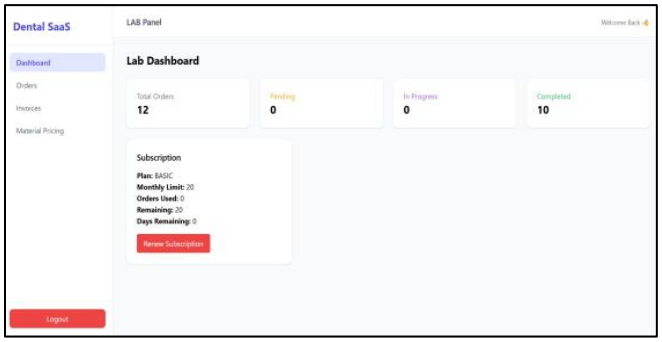

Fig. 3: Laboratory Dashboard showing Order Processing and Subscription

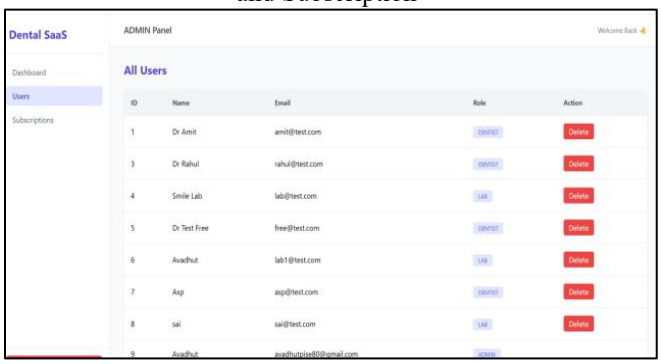

Fig. 4: Admin Panel for Managing users and Subscription Details

VI. CONCLUSION AND FUTURE WORK

The DentLink system offers a simple and efficient way to manage the workflow between dental clinics and laboratories. It replaces conventional approaches such as phone communication, messaging apps, and paper-based records with a centralized digital platform. This improves communication, reduces manual mistakes, and makes the overall process more structured and transparent. The system is developed using tools such as React.js, Node.js, and PostgreSQL, ensuring good performance, security, and scalability. Features such as patient management, order tracking, and billing support make the system more practical and help in handling daily operations effectively. Based on the testing results, the system enhances workflow efficiency and simplifies data management when compared to traditional methods. All information is stored in an organized manner, allowing users to access it whenever required. The platform also allows multiple users to use it together without delay, making it suitable for real-world applications. In the future, the system can be improved further by adding advanced features such as Artificial Intelligence for improved decision-making and analysis. A mobile application can also be introduced to increase accessibility. Additional features like automated notifications, reporting, and analytics dashboards can further improve system performance and user experience.

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